REMARKS

Per the Office Action mailed August 17, 2010, claims 1, 2, 4, 5, 8, 10, 12-14, 18-22, 31 and 36 stand rejected. Applicants respectfully request reconsideration of the application in view of the arguments presented below.

Double Patenting Rejection

The Office states that claims 1, 2, 4, 5, 8, 10, 12-14, 18-22, 31 and 36 stand provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-23 of copending Application No. 12/237,776.

Applicants respectfully request that the double patenting rejection be held in abeyance until allowable subject matter is indicated by the Office.

103(a) Rejection of Claims 1, 2, 4, 5, 14, 19, 20 and 22 *Henmi et al.* (US 4,989,375) in view of *Clark, Jr.* (3,653,161) and *Tsukamoto et al.* (4,716,687) considered separately; and further in view of *Sheu et al.* (5,025,547)

Applicants respectfully traverse this rejection. In order to render a claim obvious, the cited references must suggest each and every limitation of the claim. *See* MPEP § 2143.

The Office states that "*Henmi et al.* discloses a method of grinding a ferrous roll having a rotating roll surface **(7:31-37)**".

Henmi et al. at col. 7, lines 31-37 state:

> Referring first to FIG. 1, reference numeral 10 generally denotes a grinding wheel which is constructed according to one embodiment of the present invention, for effecting on the-spot rolling of grinding rolls as installed on hot-rolling mill stands arranged in a line, while the rolls are engaged or not engaged in a rolling process.

Henmi et al. fails to disclose a method of grinding a "ferrous roll".

The Office further states that "Henmi et al. discloses a method…with rotating grinding wheel (10), the ferrous roll, the method steps including: mounting a grinding wheel on a machine spindle; and bringing the rotating wheel into contact with a rotating roll surface and traversing the wheel across an axial roll length; and prohibiting thermal degradation **(8:16-28)**".

Henmi et al. at col. 8, lines 16-28 state:

> The outer or second abrasive member 14 includes evenly distributed short fibers of glass, carbon, Al_2O_3 or other suitable materials, as a reinforcing material for increasing its impact resistance and avoiding deformation due to its thermal expansion. The short fibers are provided in the form of bundles each of which consists of 50-500 fibers, preferably 100-200 fibers, each fiber having a length of 1-10mm, preferably about 3-5mm. Where the fibers are formed of a glass material, the diameter is held within a range of about 5-10 microns. The carbon fibers have a diameter of about 3-15 microns, while the Al_2O_3 fiber have a diameter of about 1-15 microns.

Applicants respectfully submit that *Henmi et al.* fails to disclose Applicants' claim limitations and the Office's cited recitations are unrelated to the features of Applicants' claims.

The Office further states that "Henmi does not specifically disclose setting the angle between the grinding wheel rotational axis and roll rotational axis less than about 25 degrees." The Office states that "Both *Clark, Jr.* and *Tsukamoto et al.* disclose a roll grinding apparatus having the angle between the grinding wheel rotational axis and roll rotational axis less than about 25 degrees so as to facilitate the efficiency of the grinding process."

The Office fails to point out where in *Clark, Jr.* and *Tsukamoto et al.* the aforementioned limitation is disclosed.

Clark, Jr. teaches applying programming methods to grind various roll profiles by continuously sensing the position of wheel infeed axis relative to roll axial position. See col. 20, line 46 through col. 24, line 27. *Clark, Jr.* shows roll diameter reduction and the process for achieving the reduction. See "7. Sensing and Signaling the Roll Diameter", col. 46, lines 5 through col. 50, line 55. However, *Clark, Jr.* discloses nothing about the roll tolerance that is achieved or the extent of continuous infeed compensation that was used to estimate the ratio of taper tolerance to radial wheel compensation.

Tsukamoto et al. disclose a grinding stone where the grinding stone rotary axis c is perpendicular to the mill roll rotary axis C and is offset in the vertical plane to achieve frictional grinding action between roll and grinding stone. See col. 5, lines 14-35 and Figures 1a, 1b and Figure 2. Applicants claim, in part, claim 1, "…setting the angle between the grinding wheel rotational axis and roll rotational axis less than about 25 degrees." To achieve this, the grinding

wheel rotational axis is nearly parallel to the roll rotational axis. See Figure 4B of Applicants' Figures.

The Office states that, "It would have been obvious to one having ordinary skill in the art at the time the invention was made to have made Henmi et al.'s apparatus to have the angle between the grinding wheel rotational axis and roll rotational axis less than about 25 degrees as independently taught by Clark, Jr. and Tsukamoto et al. so as to facilitate efficiency of the grinding process."

Applicants respectfully traverse this rejection as none of the cited references teach or suggest, either in combination or independently, Applicants' claim limitation (claim 1) of "...setting the angle between the grinding wheel rotational axis and roll rotational axis less than about 25 degrees." As such, it would not have been obvious to one having ordinary skill in the art at the time of the invention was made to have made *Henmi et al.*'s apparatus to have the angle between the grinding wheel rotational axis and roll rotational axis less than about 25 degrees as independently taught by *Clark, Jr.* and *Tsukamoto et al.* so as to facilitate efficiency of the grinding process.

The Office states that "It is noted that Henmi et al. does not specifically disclose maintaining a ratio of axial taper tolerance to radial wheel wear compensation of greater than 10. Henmi et al., however, discloses an equivalent approach that considers the wear of the wheel and compensation therefor; as well as the taper and the tolerance associated herein. This equivalent approach also produces expected results."

Applicants define taper tolerance and wheel wear compensation at paragraph 007 of Applicants' specification and in Applicants' After Final Response (1/25/2010) at page 7, paragraph 4.

Henmi et al., discloses at col. 12, lines 47 through col. 13 line 17 and Figure 10, a "...grinding wheel 60 having tapered boundary or bonded surfaces, i.e., complementally tapered outer and inner circumferential surfaces 62, 64..." *Henmi et al.* teach that "the inclination angle of the tapered surfaces 62,64 should not be excessive..." *Henmi et al.* make no mention of a ratio of axial taper tolerance (TT) to radial wheel wear compensation (WWC) as Applicants

claim. In these passages, *Henmi et al.* refer to "tapered surfaces" 62,64 (Fig. 10) and not a ratio of axial taper tolerance to radial wheel wear compensation.

As such, Applicants respectfully traverse this rejection as *Henmi et al.* fail to teach or suggest Applicants' claim limitation (claim 1; in part): "…bringing the rotating wheel into contact with a rotating roll surface and traversing the wheel across an axial roll length, while maintaining a ratio of axial taper tolerance (TT) to radial wheel wear compensation (WWC) of greater than 10…"

Applicants respectfully submit that the method of *Henmi et al.* is unrelated to Applicants' claimed method (preceding paragraph). As such, one of ordinary skill in the art would not achieve "expected results".

The Office states that "Henmi et al. does not specifically disclose a surface roughness of less than 5 microns. The Office states that Sheu et al. discloses a roll grinding process (Fig. 5) that achieves a surface roughness of less than 3 micrometers so as to achieve a polished finish. The Office further states that it would have been obvious to one having ordinary skill in the art at the time the invention was made to have ground Henmi's roll to a surface finish of less than 3 micrometers as taught by Sheu et al. so as to achieve a polished finish."

Sheu et al. (at col. 6, lines 23-28) do not teach or suggest "…a surface roughness R_a of less than 5 micrometer" as Applicants' claim. See Fig. 5 of *Sheu et al.* and col. 6, lines 23-28. *Sheu et al.* teach forming craters using a laser "being on the order of 3.0 microns" (*Sheu et al.* col. 6, lines 23-38) and not "a roll grinding process (Fig. 5) that achieves a surface roughness of less than 3 micrometers to as to achieve a polished finish"

Sheu et al. (col. 6, lines 23-28) state:

> Fig. 5 is a photomicrograph of the surface of a work roll in a final stand or stands of a cold rolling operation magnified 200 times. The photomicrograph shows micron-sized craters formed by a laser device, the **depth** of the craters, as formed, being on the order of 3.0 microns. Emphasis added.

Applicants respectfully submit that it would not have been obvious to one having ordinary skill in the art at the time the invention was made to have ground Henmi's roll to a surface finish of less than 3 micrometers as taught by *Sheu et al.* so as to achieve a polished

finish as the Office states as *Sheu et al.* teach forming craters using a laser and not by grinding the roll.

Claims 2, 4, 5, 14, 19, 20 and 22 ultimately depend from claim 1 and contain the limitations thereof. As stated above, *Henmi et al.* fails to teach or suggest all Applicants' claim limitations as required by MPEP §2143. Applicants submit that the rejection of Claims 1, 2, 4, 5, 14, 19, 20 and 22 as being unpatentable over *Henmi et al.* view of *Clark, Jr.* (3,653,161) and *Tsukamoto et al.* (4,716,687) considered separately; and further in view of *Sheu et al.* (5,025,547) is improper as a *prima facie* case of obviousness has not been established. Applicants respectfully request that the rejection be withdrawn.

Rejection of claims 8, 10, 12, 13, 18 and 21 under 35 U.S.C. 103(a) as being unpatentable over *Henmi et al.*; *Clark Jr.* and *Tsukamoto et al.* considered separately, in view of *Sheu et al.* and in further view of *Mori et al.*

Applicants respectfully traverse this rejection. In order to render a claim obvious, the cited references must suggest each and every limitation of the claim. *See* MPEP § 2143.

The Office states that "Referring to claims 8-10 and 12, the modified Henmi et al. does not specifically disclose a cubic boron nitride system having a vitreous bond. Mori et al. discloses a cubic boron nitride system having a vitreous bond so as to provide effective grinding with the abrasive particle without scratching the surface of the workpiece. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have made the to have made [sic] the modified Henmi's apparatus out of cubic boron nitride having a vitreous bond as taught by Mori et al. so as to provide effective grinding with abrasive particles without scratching the surface of the workpiece."

As discussed above, *Henmi et al.*, in view of *Clark Jr.* and *Tsukamoto et al.* considered separately, in view of *Sheu et al.* fail to teach or suggest Applicants' claim limitations as required by MPEP § 2143. Applicants respectfully submit that *Mori et al.* fail to teach or suggest a cubic boron nitride system having a vitreous bond.

Mori et al. teach at col. 14, lines 50-59:

> The abrasive layer 51 is formed of super abrasive grains such as cubic boron nitride (generally called CBN) abrasives or diamond abrasives. The abrasive grains have a concentration in the range of 50 to 100 and a grain size of in the rage of 80 to 180. The abrasive grains are aggregated together by using a resin bond as a binder. Material of the plain wheel 52 is of aluminum or an aluminum alloy for the purpose of easily radiating the grinding heat from the abrasive grains of the abrasive layer 51 and reducing movable mass of the grinding wheel 20.

Mori et al. further teach at col. 20, lines 12-41:

> For this purpose, it is required to set density, i.e., concentration, of the super abrasive grains contained in the abrasive layer 51 within the range of 50 to 100, and use a resin bond as a binder which is worn away along with the super abrasive grains while holding them together. If the concentration is not less than 100, the spontaneous edging of the super abrasive grains would be hard to occur, resulting in a decrease of the grinding ability. If the concentration is not larger than 50, the service life of the super abrasive grains would be shortened. Further, if a pitolifido bond or the like which is hard to wear away is used as a binder, projection of the super abrasive grains from the binder surface would be so small as to require dressing. With a combination of the above range of concentration and the binder comprising a resin bond, the super abrasive grains can be easily spontaneously edged to enable the continuous grinding without dressing.

Mori et al. teach that "it is required to use a resin bond as a binder." Applicants respectfully submit that *Mori et al.* do not disclose a vitreous bond or any mention of a bond "...wherein the bond system is one of: a) a vitrified bond comprising at least one of clay, feldspar, lime, borax, soda, glass frit, fritted materials and combinations thereof..." as Applicants' claim (claim 12; in part).

The Office states, "Referring to claim 13, Henmi et al. does not specifically disclose the grinding wheel being rotated at 3600-12000 fpm. Mori et al. discloses a grinding wheel being rotated at 3600-12000 fpm so as to minimize the occurrence of chattering marks.

Applicants respectfully traverse this rejection as *Mori et al.* fail to teach or suggest the grinding wheel rotation speed. Further, *Mori et al.* fail to teach or the suggest that the grinding wheel is rotated at **any** speed to minimize the occurrence of chattering marks. Emphasis added. As such, it would not have been obvious to one of ordinary skill in the art at the time the invention was made to have made the modified *Henmi's* apparatus out of cubic boron nitride having a vitreous bond as taught by *Mori et al.* so as to provide effective grinding with abrasive particles without scratching the surface of the workpiece.

The Office states, "Referring to claim 18, Henmi does not disclose a grinding ratio of at least 20. Mori et al. discloses a grinding ratio of at least 20 so as to prolong the grinding effort with a lightweight (CBN) wheel without adversely impacting the system. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have made Henmi et al.'s apparatus to have a G ratio of at least 20 as taught by Mori et al. so as to the grinding effort with a lightweight (CBN) wheel without adversely impacting the system."

As discussed above, *Henmi et al.*, in view of *Clark Jr.* and *Tsukamoto et al.* considered separately, in view of *Sheu et al.* fail to teach or suggest Applicants' claim limitations as required by MPEP § 2143. Applicants respectfully submit that claim 18 depends from claim 1 and contains the limitations thereof. As such, in view of the preceding arguments with regard to claim 1, claim 18 is deemed to be allowable over the cited prior art.

The Office states, "Referring to claim 21, 31 and 36, Henmi et al. does not specifically disclose a grinding wheel traverse rate of at least 50mm/min. and a grinding wheel rotational speed said mill roll rotational speed is varied in an amount of +/- 1 to 40% in amplitude, with a period of 1 to 30 seconds. Mori et al. discloses a grinding wheel traverse rate of at least 50mm/min. and a grinding wheel rotational speed said mill roll rotational speed is varied in an amount of +/- 1 to 40% in amplitude, with a period of 1 to 30 seconds so as to provide the capability of optional changing the grinding rate and optimizing the grinding process. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have made Henmi et al.'s apparatus to have the a grinding wheel traverse rate of at least 50/mm/min. and a grinding wheel rotational speed and said mill roll rotational speed is varied in an amount of +/- 1 to 40% in amplitude, with a period of 1 to 30 second so as to provide the capability of optionally changing the grinding rate and optimizing the grinding process.

Applicants respectfully submit that claim 21 ultimately depends from claim 1 and contains the limitations thereof. As such, in view of the preceding arguments with regard to claim 1, claim 21 is deemed to be allowable over the cited prior art.

Applicants respectfully submit that independent claim 31 contains the limitation of "...wherein a ratio of TT to WWC is greater than 25." Claim 36 ultimately depends from claim 31. As argued above with regard to claim 1, Applicants respectfully submit that *Henmi et al.* in view of *Clark Jr.* and *Tsukamoto et al.* considered separately, in view of *Sheu et al.* and further

in view of *Mori et al.* fail to teach or suggest Applicants' claim limitations as required by MPEP § 2143. As such, the combination of these references fails to teach all elements of those claims, and thus the combination fails to render claims 31 and 36 obvious.

Applicants respectfully submit that the 35 U.S.C. §103(a) rejections of claims 1, 2, 4, 5, 8, 10, 12-14, 18-22, 31 and 36 are improper as a *prima facie* case of obviousness has not been established. Applicants respectfully submit that claims 1, 2, 4, 5, 8, 10, 12-14, 18-22, 31 and 36 are clearly allowable over the prior art. Applicants respectfully request withdrawal of the rejections of claims 1, 2, 4, 5, 8, 10, 12-14, 18-22, 31 and 36.

CONCLUSION

Based on the arguments presented above, Applicants request withdrawal of the rejections and allowance of all claims. Applicants respectfully submit that the above arguments put the application in condition for appeal upon receipt of a Final Rejection. If the Office has any questions or comments or needs any additional information, I invite the Office to telephone me at the number listed below.

Respectfully submitted,

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